

colder being gradual in Oklahoma and mostly insufficient for a cold wave in East Texas. Warnings for livestock were included in most cold wave warnings.

Frost warnings for coast sections were issued on the 2d, 3d, 10th, 11th, 12th, and 17th, and were generally verified.—*R. A. Dyke.*

DENVER FORECAST DISTRICT

February was an unusually mild and dry month over the entire Denver district. While a number of Lows of unusual intensity appeared during the first 12 days and again during the last week of the month over the Pacific Northwest, most of them moved eastward over the northern track without the usual development of secondary disturbances on the plateau, so common in the winter months. Most of the Canadian high-pressure areas passed eastward without affecting this district, except one that was drawn southward on the 25th and 26th by a Low that moved directly southward from eastern Colorado into New Mexico, causing light precipitation in eastern Colorado on the night of the 26th. Precipitation occurred in Utah and western Colorado on the 6th–7th, attending a secondary Low that developed over northern Arizona on the 6th and moved eastward across northern New Mexico. Another secondary developed over southern Nevada on the 20th and moved eastward across Utah and Colorado, attended by precipitation in the northwestern part of the district on the 20th and 21st.

On the morning of the 10th, with a Low moving rapidly eastward across southern Missouri and a strong high-pressure area advancing southeastward from southern Idaho, warning was issued for a moderate cold wave in southeastern New Mexico, which occurred as predicted.—*E. B. Gittings, jr.*

SAN FRANCISCO FORECAST DISTRICT

There were two well marked storm periods in this district during the month. The first covered the first decade and the second the greater portion of the third decade and was mostly confined to the North Pacific States. Generous precipitation fell from central California and central Nevada northward with a fairly good amount of snow in the mountains. In southern California and southern Nevada the drought continued with but little abatement. In northern California the seasonal rainfall at the close of the month amounted to over 90 per cent of normal, while in southern California it was only slightly over 30 per cent.

The month opened with two large storm systems covering the north Pacific; (a) central about latitude 55 degrees north and longitude 140 degrees west, and (b) in latitude 45 degrees north and longitude 170 degrees east. These storms while closely following one another, maintained their individuality, and passed inland in series of small storms with greatly diminished intensity; the last of which entered the continent on the 12th. On the 6th, a large area of high pressure appeared over Midway Island and extended rapidly north and east following the storm (b). On the 9th, the area of high pressure was central in latitude 35 degrees north, and longitude 165 degrees west, with a ridge extending northward over central Alaska. At this time another storm (c) appeared over Bering Sea, and the storm (b) was central in latitude 41 degrees north and longitude 138 degrees west and had reached its maximum intensity. The motor-ship *Aorangi* passing near its center reported a barometer reading of 28.62 inches and a gale of 70 miles per hour.

This storm passed inland on the 12th, with greatly diminished intensity and a minimum barometer reading of 29.68 inches.

From the 13th, until the 19th, the Pacific area of high pressure dominated the weather in this district, and fair and pleasant weather prevailed. On the evening of the 19th the storm (c), which first appeared in Bering Sea on the 9th, began to affect the weather on the northern coast, and by the evening of the 20th it had caused precipitation over the entire district, which continued with slight intermittence over the northern and central portions until the 25th. On the 23d an area of high pressure off the southern California coast moved rapidly northeastward and increased greatly in intensity as it neared the coast. By the 24th it had covered the entire Pacific slope and adjacent ocean and gave fair and warm weather after the 25th, except for light rain in the North Pacific States on the 27th.—*G. H. Willson.*

RIVERS AND FLOODS

By H. C. FRANKENFIELD

Reference to the table at the end of this report will show that, with the exception of the flood in the Sacramento River of California, the floods of February, 1925, were not of severe character, and while they were quite numerous and widely scattered, none occurred in the great rivers of the country. Neither were there any in the South Atlantic States, except the aftermath of the great floods of January.

The floods in the Connecticut, Susquehanna, and Hudson Rivers were caused by the melting of quite deep snows attended by some rains and by the formation and subsequent breaking up of ice gorges.

The floods in the Sacramento River and its tributaries were of more decided character. The following general description was summarized from the comprehensive report of Mr. N. R. Taylor, the official in charge of the Weather Bureau office at Sacramento:

On the morning of February 5, 1925, general rains were in progress throughout the drainage basin of the Sacramento Valley, and on that night torrential rains occurred from the foothills to the highest altitudes of the Sierras, melting some of the snow that had accumulated above the 6,000-foot level. By the morning of the 6th all mountain streams were running bank full; the American River at Folsom and thence well up into its forks was higher than at any time since the big floods of 1909, and the Sacramento River at Sacramento had risen to a stage of 26 feet and was still going up. * * *

By early forenoon of the 6th the situation in Sacramento was becoming serious in that the water of the Sacramento River was backing up to the north of the mouth of the American River into the lower portions of North Sacramento, which was rapidly becoming flooded. Early in the afternoon of this date a small levee near the Southern Pacific Railroad bridge broke and increased the spread of the water, which finally occupied some two square miles or so of territory. At about 11:45 a. m. of the 6th some 20 units of the 48 units which comprise the Sacramento by-pass were opened, which deflected about a 4-foot head of water from the Sacramento River, some 3 miles above the mouth of the American, into Yolo Basin, and in the meanwhile, a considerable amount of water was pouring through Fremont Weir, which also leads into Yolo Basin. * * *

At about 1 p. m. of the 7th the river at Bensons Ferry crested at 12.9 feet, 0.1 foot below the stage predicted, but even before reaching this point a number of levees, which had been damaged by beavers, broke and some 2,000 acres of land were flooded in the lower reaches of the Mokelumne and Cosumnes Rivers. * * *

By the morning of February 7 the Sacramento River at Colusa had crested at a stage of 22 feet and by 8 a. m. of the 9th a stage of 17.9 feet, 0.1 foot below the flood stage which was predicted, was recorded at Knights Landing. After the 8th there was a slow but steady fall in all streams.

On the night of February 10, 1925, or about the time the rivers had subsided to safe stages, unusually heavy rains began falling

in the Sacramento Valley from Meridian well up into the Sacramento Canyon, and by the morning of the 11th the Sacramento River was rapidly rising throughout its upper reaches. * * *

The river at Red Bluff crested at a stage of 26.7 feet at about 8 p. m. of the 11th, when it overtopped its banks, flooding a considerable area and drowning a number of cattle the owners of which failed to heed the warnings.

It had been anticipated that the flood would also extend into the lower San Joaquin River, but it did not materialize, as the rains that had been indicated did not occur north of the drainage area of the Stanislaus River, with the result that the lower San Joaquin, which was already at low stage, took ample care of all the water from the lower tributaries.

The flood in the Willamette River of Oregon, so far as its causation was concerned, was a departure from the usual winter rule and was thus commented upon by Mr. E. L. Wells, the official in charge of the Weather Bureau office at Portland:

Most winter floods in the Willamette River are the result of very heavy warm rains for two or three days, occurring when the soil is already well filled with moisture, and they are sometimes aggravated by a considerable snow cover, which is melted by the warm rains. In the present instance no extremely heavy daily rainfall occurred, and the amount of run-off from melting snow was not great. The flood was the result of a period of five or six weeks [beginning about December 27, 1924] of almost daily precipitation over the entire drainage basin, and, to a small degree, the result of rising water in the Columbia.

All of the floods that occurred during the month were forecast with the usual degree of accuracy. As stated before, none was of very severe character and the loss and damage were not great. The few estimates received include \$10,000 in the Connecticut River drainage area, \$73,500 in the Sacramento drainage area, and \$57,650 in the Willamette drainage area, a total of \$141,150. As an offset to these losses the savings through Weather Bureau warnings were reported as having been \$80,000 in the Sacramento area and \$206,050 in the Willamette area, a total of \$286,050. These latter figures were apparently much underestimated, as the official in charge at Portland stated that the amount saved in the Willamette area was several times that reported, as the reports were not nearly complete, and many informants while stating that they were saved from all loss, failed to give any estimate of the value of the property saved.

A belated report stated that the losses in the Waccamaw drainage area of South Carolina during the flood of January, 1925, were about \$150,000.

River and station	Flood stage, Feet	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC DRAINAGE—continued					
Susquehanna:	<i>Feet</i>			<i>Feet</i>	
Oneonta, N. Y.....	12	12	13	15.1	12
		25	25	12.4	25
Bainbridge, N. Y.....	11	11	12	14.8	12
Binghamton, N. Y.....	14	12	13	17.2	12
Towanda, Pa.....	16	12	13	18.7	12
Wilkes-Barre, Pa.....	20	12	14	25.0	13
Harrisburg, Pa.....	17	12	13	18.8	13
Unadilla:					
New Berlin, N. Y.....	8	12	13	12.0	12
		24	25	9.6	24
Neuse:					
Smithfield, N. C.....	14	13	14	15.0	13
Waccamaw:					
Conway, S. C.....	7	(1)	8	9.3	Jan. 30, 31
Peedee:					
Mars Bluff, S. C.....	17	15	15	17.0	15
Santee:					
Rimini, S. C.....	12	(1)	23	23.8	Jan. 23
		26	28	12.2	27
Ferguson, S. C.....	12	(1)	28	17.1	Jan. 24
Ocmulgee:					
Abbeville, Ga.....	11	(1)	1	20.3	Jan. 23
Lumber City, Ga.....	15	(1)	1	26.0	Jan. 21
EAST GULF DRAINAGE					
Apalachicola:					
River Junction, Fla.....	15	(1)	4	32.1	Jan. 24
Blountstown, Fla.....	20	(1)	6	27.9	Jan. 27
Flint:					
Bainbridge, Ga.....	25	(1)	(1)	39.6	Jan. 24
West Pearl:					
Pearl River, La.....	13	(1)	9	17.1	Jan. 21
		21	24	13.7	23
GREAT LAKES DRAINAGE					
St. Joseph:					
Montpelier, Ohio.....	10	10	11	10.5	10
		25	25	10.6	25
MISSISSIPPI DRAINAGE					
Allegheny:					
Freeport, Pa.....	22	12	12	22.0	12
Shenango:					
Sharon, Pa.....	9	10	12	10.9	11
Tuscarawas:					
Gnadenhutten, Ohio.....	9	10	13	10.3	11
		24	26	11.6	25
Green:					
Lock No. 4, Woodbury, Ky.....	33	23	27	37.3	25
Lock No. 2, Rumsey, Ky.....	34	25	(1)	36.4	28
Wabash:					
Lafayette, Ind.....	11	24	26	13.1	25
Illinois:					
Peru, Ill.....	14	9	17	15.3	10
		24	(1)	15.3	25
Henry, Ill.....	7	9	(1)	8.8	13, 14, 27
Havana, Ill.....	14	11	13	14.2	12
Beardstown, Ill.....	12	7	(1)	14.3	13 to 16
North Platte:					
North Platte, Nebr.....	5	4	13	5.6	6
Grand:					
Gallatin, Mo.....	20	24	25	26.5	25
Chillicothe, Mo.....	18	24	26	20.6	25
PACIFIC DRAINAGE					
Sacramento:					
Red Bluff, Calif.....	23	11	12	26.8	11
Knights Landing, Calif.....	18	14	16	18.2	15
Mokelumne:					
Benson's Ferry, Calif.....	12	7	7	12.9	7
Columbia:					
Vancouver, Wash.....	15	5	10	16.8	9 and 10
Willamette:					
Eugene, Oreg.....	12	4	5	14.2	5
Albany, Oreg.....	20	5	7	23.5	6
Salem, Oreg.....	20	5	7	20.7	6
Oregon City, Oreg.....	12	(1)	11	14.7	7
Portland, Oreg.....	15	3	11	19.5	8
Santiam:					
Jefferson, Oreg.....	10	3	5	12.5	4
Clackamas:					
Three Links, Oreg.....	8	3	3	8.3	3

¹ Continued from last month.

² No record for February; gage washed out.

³ Estimated.

⁴ Continued at end of month.

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC DRAINAGE					
Connecticut:	<i>Feet</i>			<i>Feet</i>	
White River Junction, Vt.....	15	12	13	18.9	12
Hartford, Conn.....	16	14	15	16.2	14
Hudson:					
Troy, N. Y.....	15	12	13	15.8	12
Albany, N. Y.....	12	12	13	13.1	13
Castleton, N. Y.....	10	13	14	11.8	13
Mohawk:					
Utica, N. Y.....	11	12	12	11.2	12
		24	24	12.6	24
Schuylkill:					
Reading, Pa.....	10	12	12	14.8	12